

Exhibit A
Scope of Services
SR-532 Seismic Response Studies
WSDOT Agreement No. Y-10209, Task Order AB

This scope of services outlines work that CH2M HILL (CONSULTANT) will perform for the Washington State Department of Transportation (WSDOT) on the SR-532 Project. The objective of the work is to conduct a site-specific, seismic ground response analysis using nonlinear effective stress computer modeling methods for the SR-532 Bridge at the Stillaguamish River crossing. The following sections summarize assumptions made for the scope of services, the specific services that will be provided, subconsultants who will support CH2M HILL, and the estimated schedule for this work. An estimate of costs for these services is provided as Exhibit E.

1.0 Assumptions:

The following assumptions were made for the scope of work:

- WSDOT will drill and sample one test hole and conduct one seismic cone penetrometer test (sCPT) sounding at the project site. The test hole will extend to approximately 150 feet below the ground surface. WSDOT will conduct Standard Penetration Tests (SPTs) and obtain 3-inch diameter Shelby tube samples from the test hole. The seismic CPT sounding will extend to refusal. The field work will take no more than 3 days to complete. CPT sounding will be conducted before the drilling and sampling to help in the determination of sampling intervals.
- A single downhole geophysical survey will be conducted by Northwest Geophysical Associates (NGA) under subcontract to CONSULTANT. WSDOT will provide a PVC-cased borehole to a depth of 150 feet for the geophysical survey. The location of the cased borehole will be such that NGA will be able to access the test hole location with a 4-wheel drive truck. The borehole will be grouted with a stiffness compatible grout. CONSULTANT will provide instructions for grouting.
- WSDOT will conduct soil classification tests on representative samples collected from the soil test boring. CONSULTANT will identify the type and location of samples to be tested. Static and cyclic simple shear tests will be conducted by Megg Consulting Ltd. (Megg) on 6 representative high quality soil samples (2 static and 4 cyclic) under subcontract to CONSULTANT.
- CONSULTANT will conduct site response studies using the computer software DMOD. The analyses will be conducted for total and effective stress conditions. Results will include response spectra, cyclic shear stresses, maximum shear strains, and pore-water pressure buildup at representative depths. Up to seven earthquake records will be used for the analyses. Earthquake motions will be input at up to two depths within the DMOD soil column model.

- CONSULTANT will prepare a draft and final report. Three hard copies and one electronic copy of the draft report will be submitted to WSDOT for review. Comments will be reconciled and a final report prepared. Three hard copies and one electronic copy (pdf format) of the final report will be prepared and submitted to WSDOT.
- CONSULTANT staff will participate in four meetings with WSDOT's staff and others (e.g., independent peer reviewer) during the project. Two of the meetings will be held in Tumwater, and the other two will be held at CONSULTANT'S office in Bellevue.
- It is assumed that the soil samples will be free of contamination.
- While at the project site, CONSULTANT is not responsible for the health and safety of others, other than CONSULTANT'S own personnel, and is not responsible for those duties that belong to WSDOT and/or other entities, and do not relieve WSDOT and / or other entity of their obligations, duties, and responsibilities.
- In soils, foundation, groundwater, and other subsurface investigations, the actual characteristics may vary significantly between successive test points and sample intervals and at locations other than where observations, exploration, and investigations have been made. Because of the inherent uncertainties in subsurface evaluations, changed or unanticipated underground conditions may occur that could affect total PROJECT cost and/or execution. These conditions and cost/execution effects are not the responsibility of CONSULTANT.
- The CONSULTANT may reasonably rely upon the accuracy, timeliness, and completeness of the information provided by WSDOT or others.

2.0 Scope of Services

The tasks under this scope of services are described in the following six subsections.

2.1 Project Administration

- Finalize task agreement with WSDOT. Prepare project instructions and quality management plans.
- Prepare subcontracts with Professor S.L. Kramer, Northwest Geophysical Associates, and Megg Consulting Ltd.
- Provide management of project.
- Prepare monthly invoices with backup.

2.2 Field Program

- Review existing geotechnical information for the site, available geology information, firm-ground design ground motions based on AASHTO Hazard Maps, and relevant portions of revised Section 6 of WSDOT's Geotechnical Design Manual.
- Prepare a health and safety plan for CONSULTANT field staff.

- Provide geotechnical engineer to log test holes and to coordinate CPT sounding. Standard Penetration Tests will be conducted at 5-foot intervals in the upper 80 feet of silt and sand, and at 10-foot intervals in the dense sand and gravels located below approximately 80 feet. Up to 7 Shelby tube samples (3-inch diameter) will be collected in silts and sand deposits. The location of the Shelby tube samples will be determined on the basis of the CPT sounding. The geotechnical engineer will also provide support during downhole survey conducted by NGA.
- Prepare boring logs in gINT based on the field drilling and sampling program.

2.3 Laboratory Program

- Review results of field drilling and sampling program and identify samples that will be sent to Megg for gamma ray evaluation and laboratory testing. Develop test program for Megg:
 - Testing will include one or more static simple shear tests, strain-controlled cyclic simple shear tests, post-cyclic residual strength tests, and post-cyclic volumetric strain tests.
 - For planning purposes, it is assumed that 2 static simple shear tests, 4 cyclic simple shear tests, 2 post-cyclic residual strength tests, and 2 post-cyclic volumetric strain tests.
 - Final types and numbers of tests will be determined following review of field information and after discussions with WSDOT and Professor Steve Kramer, the independent peer reviewer for the project.
- Identify classification testing program to be conducted by WSDOT.
- Coordinate delivery and testing of samples by Megg.

2.4 Analysis

- Review field and laboratory results and develop soil cross-sections for analysis.
- Develop response spectrum at firm-ground level from AASHTO Hazard Maps based on hazard level of 7 percent in 75 years. Identify representative time histories for site response analyses, including scaling. Review selection of time histories with WSDOT's staff and Professor Kramer and reach agreement on record selection.
- Estimate soil properties for DMOD model. Use available data in existing geotechnical report by GeoEngineers to conduct initial trial analyses while laboratory testing is being conducted by Megg.
- Update soil parameters for DMOD site response model once laboratory test results are available from Megg. Repeat site response analyses based on final soil model.
- Summarize results, and coordinate an independent review of results by Professor Kramer.
- Conduct final DMOD analyses based on discussions and conclusions reach in meeting with WSDOT staff, Professor Kramer, and CONSULTANT.

2.5 Reporting

- Prepare draft report summarizing results of site response analyses and submit to WSDOT and Professor Kramer for review. Three hard copies and one electronic copy will be provided to WSDOT.
- Reconcile comments by WSDOT and Professor Kramer and prepare a final report for submittal to WSDOT. Three hard copies and one electronic copy (pdf format) will be submitted to WSDOT.

2.6 Meetings

- Attend up to four meetings during the progress of the work. Dates of meeting will be determined by CONSULTANT and WSDOT, but are likely to occur (1) following the field work and before assigning laboratory tests, (2) after selection of earthquake time history analyses and before initiation of DMOD analyses, (3) after receipt of laboratory cyclic testing information, and (4) following completion of final DMOD analyses and before preparation of draft geotechnical report.
- Prepare and distribute meeting notes from each meeting.

3.0 Subconsultants

Three subconsultants will be used to support CONSULTANT during the project, as summarized below:

- **Independent Peer Reviewer – Professor S.L. Kramer/University of Washington, Seattle, WA:** Professor Kramer will provide independent review of the work at various points during the project.
- **Northwest Geophysical Associates (NGA), Corvallis, OR.:** NGA will provide downhole testing services at one location to a maximum depth of 150 feet.
- **Megg Consulting Ltd, Vancouver, BC:** Megg will provide gamma ray photographs of samples and static and cyclic direct simple shear tests on samples identified by CONSULTANT.

4.0 Proposed Schedule

The proposed schedule for the project is as follows:

Task	Description	Start Date	Completion Date
1	Project Administration	October 13, 2008	February 21, 2009
2	Field Program	October 13, 2008	October 28, 2008
3	Laboratory Program	November 3, 2008	November 29, 2008
4	Analyses	November 3, 2008	December 20, 2008
5	Reporting	December 22, 2008	January 30, 2009
6	Meetings	As Determined Appropriate	

The above schedule may be modified during the project. The CONSULTANT'S ability to meet this schedule is contingent upon timely receipt of comments from WSDOT and assumes that the WSDOT field work will be conducted in a timely manner.

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LEGEND



BOREHOLE LOCATIONS

Image Data Source: W:\Data\GIS\GISOSC\GEODATA\IMAGERY\High_Res\USGS\SeattleTacoma\UA\SeattleTacoma\UAcatalog



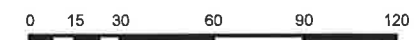
TEST BORING LOCATIONS

STANWOOD TO CAMANO CORRIDOR IMPROVEMENTS

SR-532 SRMP 3.4 JOB # XL-2770

OCTOBER 8, 2008

FEET



1:720

1 INCH EQUALS 60 FEET

PROJECT MANAGER	DAVE JENKINS
MAP ID	SR532100808-BRIDGEREPLACEMENT
PREPARED BY	JEFF FISHER

M:\GEOGIS\Projects\SR-000\Drill Crew Navigation Maps\SR-532\SR532100808-BridgeReplacement



**SR 532 Geotechnical Investigation
Preliminary Results
October 15, 2008**

Depth (ft)	SPT N-Value	Visual Soil Description
Tuesday - October 14		
5	5	SM
10	6	SM
15	4	SP-SM
20	11	SP-SM
25	14	SP
29	17	SP
34	13	SP-SM/SM
39	23	SP-SM
44	12	ML
49	SHELBY	SM/ML
54	10	SM/ML
59	3	SM/ML
64	7	SM/ML
69	SHELBY	ML
71	5	ML
Wednesday - October 15		
74	SHELBY	
76	6	ML
79	SHELBY	ML-SM
81	14	SM
84	11	SM-ML
86	SHELBY	
89	13	SM-ML
91	SHELBY	

94	23	ML-SM
99	38	SP
109	35	NO RECOVERY (TRIED TWICE)
119	38	SP
129	67	SP WITH GRAVEL
139	47	SP
149	51	SP

Yellow shading => candidate sampling depths